

Protecting Backyard Apple Trees from Apple Maggot

Apple Maggot Invades the Pacific Northwest

Since its initial detection in 1979 in Portland, Oregon, the apple maggot expanded its distribution in the Pacific Northwest and created a new challenge to homeowners with backyard apple trees. The apple maggot (AM), *Rhagoletis pomonella*, is a native insect of eastern North America. Originally, apple maggot fed on hawthorn fruit until the European colonists introduced the domestic apple to North America. Today, apple maggot is a key apple pest that continues to expand its distribution throughout North America. In addition to hawthorns and apples, apple maggot has been reported in crab apples, plums, apricots, pears, cherries, *pyracantha* berries and wild rose hips.

While apple maggot can render the fruit on a backyard apple tree inedible, it poses a serious threat to the commercial apple industry in the Pacific Northwest. Commercial growers face additional costs for insecticides to protect their fruit from apple maggot and they face restrictions to some overseas markets due to strictly enforced pest quarantines. To date, the apple maggot is not established in the major apple production areas of central or eastern Washington. The cooperation and assistance from homeowners is critical to regulatory agency efforts to maintain these areas Apple Maggot-free.

Apple Maggot Damage to Apples & Life Cycle

Apple Maggot adults are known as fruit flies (fig. 1). Female Apple Maggot flies lay their eggs singly in apples and other fruits. This egg-laying activity begins in July and continues through early October. When the female lays an egg, she makes a tiny puncture in the fruit skin and inserts the egg just below the skin. This initial fruit damage is easily overlooked, but eventually leads to fruit dimpling (fig. 2).



Apple maggot eggs hatch in three to seven days as small (less than 1 mm) cylindrical, cream-colored

larvae known as maggots. Each maggot lacks legs and a visible head capsule, but has two dark mouth hooks that protrude from a tapered head (fig. 3). As apple maggots tunnel through the apple flesh, they leave characteristic winding brown trails (fig. 4) that are best seen when the fruit is cut open (fig. 5). The first indication that a backyard apple tree is infested with apple maggot is when the homeowner discovers these brown trails in their fruit at harvest. These maggots will measure 6 to 8 mm long when fully mature. AM-damaged fruit becomes soft, rotten and often drops from the tree.



Apple Maggot Quarantine Program

Although the AM fly is a poor flier, it has expanded its range to areas in Washington State, California, Idaho, Oregon, Utah and Colorado. Apple maggot is established in twenty western Washington counties as well as Klickitat, Skamania and Spokane Counties. To prevent apple maggots from spreading, local authorities rely on early detection and immediate eradication programs to prevent permanent infestations. Washington State Department of Agriculture (WSDA) and local Horticultural Pest & Disease Boards monitor apple maggots throughout Washington State.

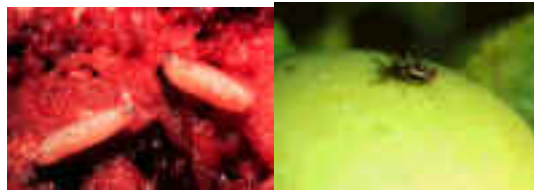
Authorities suspect that the apple maggot is transported as maggots or eggs within infested fruit. To prevent further spread, quarantine areas are established around counties with known apple maggot infestations. Highway signs have been posted along some Washington routes that state "Apple Maggot Quarantine Area/ Please do not transport homegrown tree fruit" (fig. 7A & 7B). These signs are part of an educational effort to discourage homeowners and fruit consumers from transporting backyard apples and tree fruits that may be infested with apple maggot. It is illegal for anyone to carry backyard or noncommercial tree fruit north into western Canada, south into Oregon or across the Cascade Mountains into the AM-free areas of eastern and central Washington. For more information on these quarantine programs, contact the WSDA at (509) 225-2609.



Proper Pest ID

Since apple maggot is not established in all counties in Washington State, this insect may not be a problem in your county. Contact your local WSU Cooperative Extension Office to find out if you need to protect your backyard tree from apple maggot. Alternatively, you may wait until you first detect that characteristic damage of apple maggot in your backyard apples before initiating a control program.

There are two major pests that tunnel into apple fruit here in the Pacific Northwest-- the codling moth and the apple maggot. Proper identification of these two pests will help you protect your fruit. The larvae of codling moth are pinkish or cream-colored "worms" with a distinct black or dark brown head and six claw-like legs (fig. 8) while the apple "maggot" is white, headless and legless. Codling moth larvae tunnel straight to the core of an apple (fig. 9) and often there is granular brown excrement around an entry hole into the apple (fig. 10).



Monitoring AM Flies

Summer temperatures, soil types, rainfall, wind, geographic location and topography affect when AM flies emerge from their overwintering sites in the soil and fly into apple trees. Typically, growers and homeowners monitor for AM flies to initiate their insecticide spray program. Most spray programs start within one week after the first AM fly is captured.

One practical and effective way to monitor apple maggot flies is to hang yellow, rectangular sticky traps in your tree (fig. 11). The yellow color attracts flies over short distances and they become trapped by the sticky substance. Other types of sticky traps are available including red spherical traps that resemble apples. The trapping efficacy may be improved by using ammonia extracts or fruit essences as fly lures. In late June, these traps should be hung on the apple tree at eye level in the tree foliage. Tightly secure these traps to prevent excessive trap swinging in the wind. Trim back foliage and any fruit within 12 inches of the trap to increase trap efficacy. These traps should be checked daily for adult flies. Since these traps attract many flies, be sure to familiarize yourself with the distinct wing pattern, body size and color of the AM fly (fig. 12). These traps will eventually lose their tackiness and need to be replaced every 3 - 4 weeks. Depending on brand of lure used, the lure will have to be changed on regular intervals also.



Timing is critical for effective management with insecticides

The traditional approach to protecting apples from apple maggot was to spray backyard trees with organophosphate insecticides. Since apple maggot spends most of its life cycle within the fruit or buried in the soil, these insecticides must be timed to coincide with adult fly activity. AM flies are active from late June to October. Apply the first insecticide spray within seven days of trapping the first adult on yellow sticky cards. Repeat applications every 7 to 14 days until preharvest, or more frequently if it rains. It is not necessary to continue reapplying the pesticide if AM flies are no longer captured on traps after 3-4 weeks. Always read and follow pesticide label before use, especially regarding personal and environmental safety precautions. Observe the preharvest interval (time interval between last spray application and fruit harvest) on the insecticide label. This interval will prevent unacceptable pesticide residues on your harvested fruit.

Recent public concerns about misuse and overuse of pesticides have led to the removal of most organophosphate insecticides available to homeowners. Diazinon was a widely recommended product for homeowners to control apple maggot, but most diazinon labels no longer permit use in backyard apples. All diazinon products will be removed from retail markets by December 31, 2004. Other organophosphate insecticides, like methoxychlor-malathion products, may still be available to homeowners. Check with your local WSU Cooperative Extension office for a listing of those products currently available for homeowners to use for apple maggot control.

Management with Kaolin Clay

One product that homeowners may consider using for control of apple maggots is a kaolin clay (such as Surround[®], Surround At Home[®]). These clay products are not true pesticides and are not toxic to apple maggot or other insects. These products form a barrier film that irritates insects and disguises the host. Insect pests avoid the kaolin-treated trees and fly to other potential host trees. Kaolin clay works best when the visible film barrier is established over the entire tree before fly activity begins. Begin applying kaolin clay by late-June and reapply every 7 to 14 days, or more frequently if it rains, to maintain a good visible film on the apples (fig. 13). Alternatively, you can monitor apple maggots with sticky cards and begin applying kaolin at first fly catch. Apply Surround At Home[®] at a rate of 1/2 lb. (about 3 cups) per gallon of water and spray onto tree

until the product begins to drip from the leaves. Use enough product at this concentration to cover the entire tree. Before applying kaolin be sure to read the label, agitate the mixture in the sprayer often and use caution to prevent drift to nearby plants and areas. Kaolin clay can be applied up to the day the fruit is harvested. The white residue can be washed off the fruit with a power sprayer or with a brush under running water.

Kaolin clay products will suppress a broad range of insects that feed on apple leaves and apple fruit including codling moth and leafrollers. Homeowners may consider applying kaolin clay as early as petal fall and continue on a 7 to 14 day schedule to protect apples from other insect pests. Beware that kaolin clay does not kill insects and they can fly to adjacent fruit trees.

Other management strategies

The easiest management strategy to control apple maggot would be not to plant or grow apple trees in your backyard. Since apple trees are commercially grown throughout the Pacific Northwest, apples are readily available to consumers. Furthermore in Washington State, homeowners have a legal responsibility to manage insect pests that may reside their backyard fruit trees. Homeowners not willing to accept this responsibility to protect their fruit trees from apple maggots and other pests should remove all fruit trees from their residential property.

At low fly populations, the same sticky traps used to monitor AM flies may be used to trap out invading flies. Place one trap in each small apple tree (less than 8 feet tall), 2-4 traps on medium-sized trees or 6-8 traps on standard-sized apple trees (20 to 25 feet tall). You will need to scrap any flies or insects from the trap weekly. These traps will need to be replaced or recoated with the sticky insect adhesive every 3-4 weeks. At high fly populations or when fruit in the tree is already infested with maggots, these sticky traps alone will not insure adequate protection of your apple crop from the apple maggot.

Backyard sanitation is one of the most effective management strategies that homeowners can adopt. Homeowners should remove or treat any alternate hosts for apple maggot including crab apples, ornamental hawthorns or other fruit trees. Although AM flies are not strong fliers, any wild or untreated hosts within 1/4 to 1/2 mile can serve as a source for apple maggots in your backyard. Homeowners should also regularly inspect fruit while it is on the tree, and remove then destroy any insect-infested fruit. Do not dispose of these infested fruit onto the ground. Apple maggot will continue to develop inside the dislodged fruit and then pupate in the soil. Some control can be achieved by picking up and destroying fallen apples at weekly intervals between early August to harvest.

To facilitate backyard sanitation, homeowners should plant apple trees grafted onto dwarfing rootstocks like M9 or M26. Dwarfing rootstocks will produce smaller trees (less than 12 feet tall) that are easier to spray, easier to search and inspect the fruit, and easier to harvest the fruit at the end of the season with minimal ladder use.

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Photo courtesies: Figures 1 & 4, - *Integrated Pest Management for Apples & Pears*, by B. L. P. Ohlendorf, Univ. CA Statewide IPM Project, Davis, CA; Figures 2, 5, 8, 10, & 11- *Orchard Pest Management: A Resource Book for the Pacific Northwest*, Edited by E. H. Beers et al., published by the Good Fruit Grower, Yakima, WA, 1993; Figure 3- Anon., *WSU Extension*; Figures 6, 7 & 12- M. K., WSDA; Figure 9- M.R.B., WSU Extension; Figure 13- John Mosko, Englehard Corp.

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